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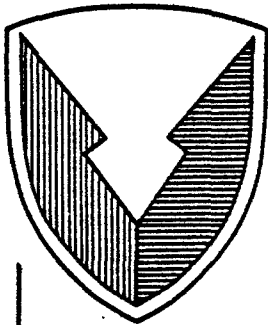
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R D & E

C E N T E R

Technical Report



No. 13426

ROLLER STRAIGHTENING

OF TRACK PINS

A MARKET SURVEY

APRIL 1989

Sam B. Catalano
U.S. Army Tank-Automotive Command
ATTN: AMSTA-TMC
Warren, MI 48397-5000

By _____

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U.S. ARMY TANK-AUTOMOTIVE COMMAND
RESEARCH, DEVELOPMENT & ENGINEERING CENTER
Warren, Michigan 48397-5000

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

| | | | | | |
|--|-------|---|---|---|---------------------------------|
| 1a. REPORT SECURITY CLASSIFICATION Unclassified | | | 1b. RESTRICTIVE MARKINGS | | |
| 2a. SECURITY CLASSIFICATION AUTHORITY | | | 3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for Public Release: Distribution is Unlimited | | |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE | | | | | |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S) | | | 5. MONITORING ORGANIZATION REPORT NUMBER(S) 13426 | | |
| 6a. NAME OF PERFORMING ORGANIZATION U.S. Army Tank-Automotive Command | | 6b. OFFICE SYMBOL (If applicable) and AMSTA-TMC | 7a. NAME OF MONITORING ORGANIZATION U.S. Army Tank-Automotive Command | | |
| 6c. ADDRESS (City, State, and ZIP Code) Warren, MI 48397-5000 | | | 7b. ADDRESS (City, State, and ZIP Code) Warren, MI 48397-5000 | | |
| 8a. NAME OF FUNDING / SPONSORING ORGANIZATION | | 8b. OFFICE SYMBOL (If applicable) | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER | | |
| 8c. ADDRESS (City, State, and ZIP Code) | | | 10. SOURCE OF FUNDING NUMBERS | | |
| | | | PROGRAM ELEMENT NO. | PROJECT NO. | TASK NO. |
| | | | WORK UNIT ACCESSION NO. | | |
| 11. TITLE (Include Security Classification) Roller Straightening of Track Pins, A Market Survey (U) | | | | | |
| 12. PERSONAL AUTHOR(S) Catalano, Sam B. | | | | | |
| 13a. TYPE OF REPORT Final | | 13b. TIME COVERED FROM Oct 87 TO April 89 | | 14. DATE OF REPORT (Year, Month, Day) April 1989 | |
| 15. PAGE COUNT 68 | | | | | |
| 16. SUPPLEMENTARY NOTATION | | | | | |
| 17. COSATI CODES | | | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) | | |
| FIELD | GROUP | SUB-GROUP | | | |
| | | | Roller Straightening Market Survey | | |
| | | | Chisel Straightening Literature Search | | |
| | | | Track Pins | | |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number) Track pins undergo heat treatment during manufacturing to induce appropriate hardness but warp in the process. Straightening is needed before further processing. This is done via chisel straightening (three point bending). Roller straightening should provide improved track pin performance. A market survey was conducted to find existing firms interested and able to implement roller straightening of track pins used in the Army M1 tank into an existing manufacturing plant. Questionnaires were sent to those who responded to a call for potential contractors placed in the Commerce Business Daily Journal. Only four respondents returned completed questionnaires. Of the four, only two truly addressed roller straightening; the others answered in terms of chisel straightening. | | | | | |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS | | | 21. ABSTRACT SECURITY CLASSIFICATION Unclassified | | |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL Catalano, Sam B. | | | 22b. TELEPHONE (Include Area Code) (313) 574-8832 | | 22c. OFFICE SYMBOL AMSTA-TMC |

PREFACE

This effort was funded under the Manufacturing Methods and Technology (MMT) Program, Project No./Category code: 1P665810D125 as authorized by the Manufacturing Technology Branch, AMSTA-TMM, U.S. Army Tank-Automotive Command, Warren, MI.

Thanks are extended to Mr. Leon Burg, TACOM, Technical Library, ASQNC-TAC-DIT, for his assistance in doing a literature search of related work done by other U.S. Government facilities. Further appreciation and acknowledgements are extended to Mr. Mark Smith, TACOM, RDE Procurement Division, AMSTA-IRDA, for his efforts and cooperation in soliciting prospective contractor interest in doing roller straightening of track pins for Army tracked vehicles. Thanks are also extended to Mr. Charles Lambright, American Analytical Corporation, for his guidance and knowledge of the roller straightening process.

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1.0. INTRODUCTION

Track pins (See Figures 1-1 and 1-2) used in Army tracked vehicles undergo heat treatment during manufacturing to induce appropriate hardness. In the process, the pins warp and need straightening before further processing. The problem is to straighten the pins without decreasing pin fatigue life or strength. Presently, straightening is done by chisel straightening, accomplished by supporting the pin at the ends and bending it in the middle until the outer fibers yield and the pin is straight enough to continue processing.

In the past, this operation was done at labor intensive work stations with a pneumatic press and a dial indicator. Often the bending force had to be applied several times at different places in order to straighten the pin enough. Frequently, a reverse warp was induced by overpressure and the pin had to be restraightened. Recently this operation has been automated, but the problem remains. Chisel straightening leaves pins with selected areas of yielded/plastically deformed outer fibers which can act as stress risers and reduce pin fatigue life, strength and reliability.

These drawbacks would not occur if straightening were done via roller straightening. Roller straightening is presently used in industry for straightening warped car and truck axles. It is done by simultaneously exerting a bending force and a rolling motion. This straightens the axle and leaves a more uniform pattern of outer fiber yielding than that caused by chisel straightening. If this process were used instead of chisel straightening, longer lasting track pins would be manufactured and used on Army tracked vehicles. Continued use of chisel straightened track pins will mean continued use of track pins with lower fatigue life than that possible with roller straightened pins.

2.0. OBJECTIVES

The objectives of this effort were:

- To do a market survey of existing firms that could do required roller straightening of track pins for Army tracked vehicles in a manufacturing plant. The survey attempted to determine the knowledge, experience and abilities of industrial contractors interested in doing this task.
- To get cost estimates from interested contractors for this project.

3.0. CONCLUSIONS

● There are two contractors with ability, knowledge and interest in doing/implementing roller straightening of M1 and M60 track pins in a manufacturing plant. They are the American Analytical Corporation (AAC), Elyria, OH, and the Robert C. Reetz Company (RCR), Pawtucket, RI. Both are small businesses and may rely on some subcontracting.

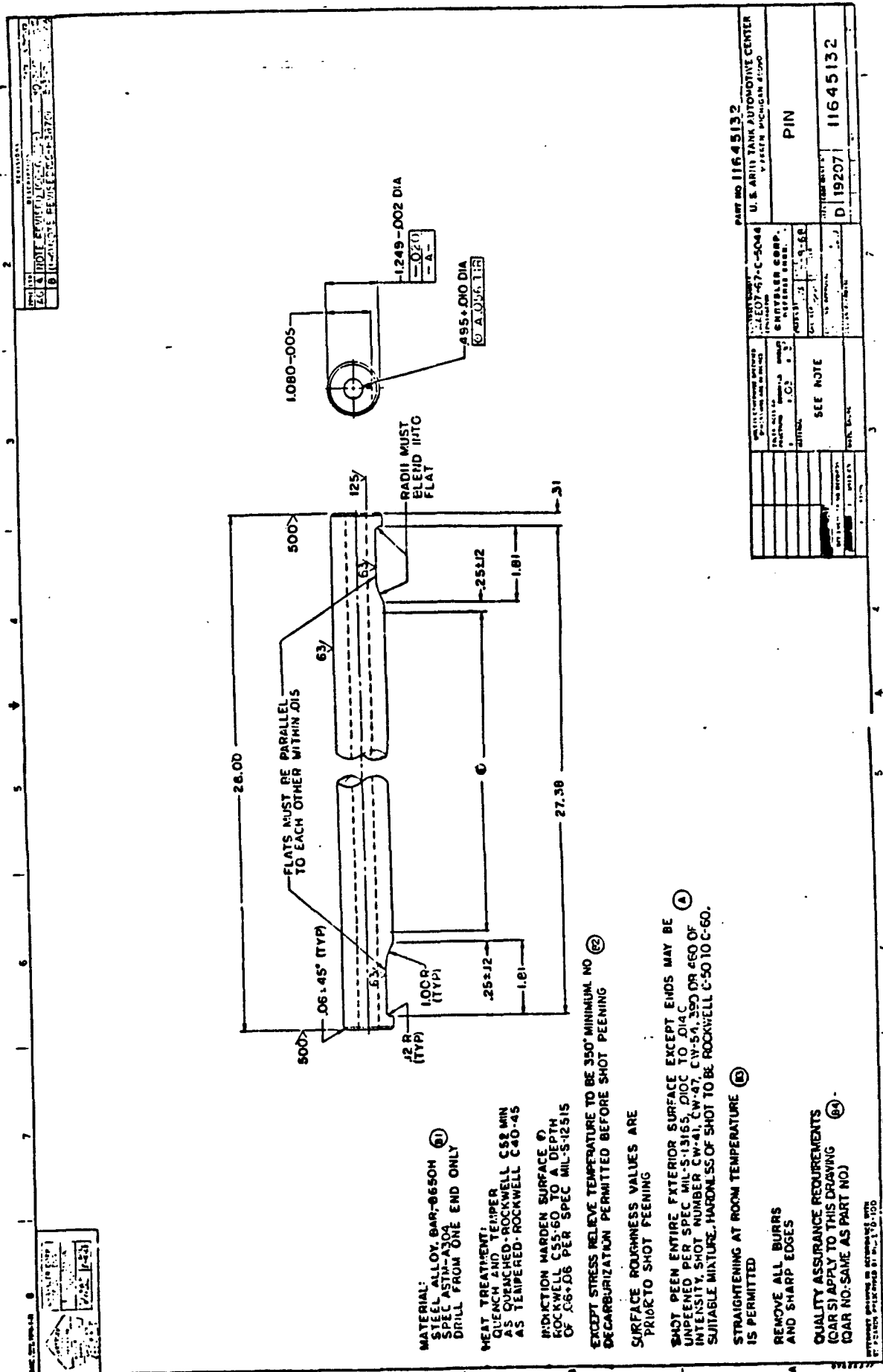
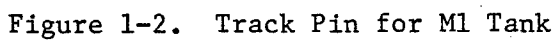


Figure 1-1. Track Pin for M60 Tank



● The major cost of the effort would be for equipment. Costs mentioned for equipment in the replies varied from \$250,000-\$1,000,000, with the most likely cost being about \$500,000. Other expenses would be the normal contractor-subcontractor costs, about \$100,000-\$150,000. In addition to these costs, the project would involve TACOM participation in contract monitoring, fatigue testing and residual stress measurement.

4.0. RECOMMENDATIONS

4.1. Study Program

Roller straightening of track pins should be pursued through a study program before outlaying large expenses for roller straightening equipment. The study program should use existing roller straightening equipment accessible to the contractor/subcontractor. Straightened pins would then be submitted to TACOM for fatigue testing, residual stress measurement and field testing.

4.1.1. Potential Problems. According to an article published in the August 1987 issue of the Magazine of the Heat Treating Industry, L.H. Kirkell, president of Blairsville Machine Products (BMP), looked into roller straightening and was disappointed because the roller straighteners "invariably twisted the two broached grooves at the ends of the each shaft out of parallel." Potential contractors should be informed of this potential problem and asked how they plan to deal with it before award of contract.

4.2. Plant Implementation

If the study program is successful, roller straightening equipment should be purchased and an appropriate plant (perhaps BMP) should be picked to implement this manufacturing method. BMP is the major producer of track pins for the Army.

5.0. DISCUSSION

5.1. Survey Background

The approach used in our survey was first to gather information about the process, then solicit for interested contractors. Information gathering was found through literature searches and conversations with various potential contractors. Solicitation for interested contractors was done with the help of Mr. Mark Smith, TACOM, RDE Procurement Division, AMSTA-IRDA.

The Commercial Business Daily Journal (CBDJ) solicitation is in Appendix A. The questionnaire is in Appendix B. A scoring matrix was prepared in advance, anticipating the need to evaluate incoming answered questionnaires. The scoring matrix is in Appendix C. It is filled out for the hypothetically perfect contractor, showing the highest scores possible in each category and the highest total score possible.

Solicitations were published in the CBDJ calling for interested contractors to request a questionnaire from TACOM. Questionnaires were sent to all companies who requested them. Only four companies returned them to TACOM. Those companies who had requested questionnaires but never returned them were later contacted to find out their intentions. It was determined that all companies intending to submit completed questionnaires had already done so. Only two of the four respondents truly addressed the roller straightening process, AAC and RCR.

Responses from the various companies are shown in Appendices E through H. The Magazine of the Heat Treating Industry article mentioned in Recommendations, 4.1.1. was submitted along with a response from Kummert Tools for Industry, Inc., Baldwinsville, NY.

5.2. Literature Search

The literature search covered both private and government sectors. The government sector was covered with the help of Mr. Leon Burg, TACOM, Technical Library, ASQNC-TAC-DIT. With his assistance, Defense Technical Information Center (DTIC) Form 4 was submitted for abstracts of work done/reported in the government sector on any work relating to roller straightening. The private sector was searched by reviewing abstracts in the Engineering Index back as far as 1969 on all topics relating to roller straightening.

The results of the literature search corroborated a statement made by the president of AAC that there is not much published material on roller straightening. All of interest that was found in searching through abstracts from both the private and government sectors was that the process was developed in Germany. No abstracts were found describing benefits gained through roller straightening.

APPENDIX A

COMMERCE BUSINESS DAILY SOLICITATION

Solicitation As Appeared In Commerce Business Daily 10 June 88, p. 15.

34 Metalworking Machinery - Potential Sources Sought

U.S. Army Tank-Automotive Materiel Readiness Command,
Warren, MI 48397-5000 313/574-6802 or 6807

34 - MARKET SURVEY: TRACK PIN ROLLER STRAIGHTENING CAPABILITY.

It is anticipated that a market survey will be released in Jun 88 seeking sources interested in furnishing the supplies/svs. necessary to perform roller straightening of M1A1 track pins in a mfg. environment. One million track pins per yr. become warped due to heat treatment during mfg. and require straightening prior to further processing. Therefore automated handling is desired. Results of the market surveys will be used as a basis to determine the experience, knowledge and capability of potential organizations to perform roller straightening of track pins. Issuing ofc. AMSTA-IRDA/Mark Smith, cont. spec. PRDAS 313/574-8574. Cont. ofcr. John Cash/attn. AMSTA-IRDA/313/574-8571. (160)

APPENDIX B

QUESTIONNAIRE

SURVEY OF TRACK PIN ROLLER STRAIGHTENING CAPABILITY

The purpose of this market survey is to determine the capability, knowledge and experience of existing firms to perform roller straightening of M1A1 track pins in a manufacturing plant environment, as well as obtain an estimate of costs involved.

These track pins become warped due to heat treatment during manufacturing, and require straightening prior to further processing. A million or so pins per year require straightening. Therefore, automated handling is desired. The survey involves: selecting/pricing of required equipment; listing of equipment manufacturers capable of furnishing the equipment; listing of present users, applications and equipment used; determine impact roller straightening has on track pin fatigue life (and surface residual stress); and gathering information on possible sources interested in participating in a competitive bid to establish roller straightening of M1A1 track pins in a third party plant.

Please answer all questions applicable to your capability, knowledge and experience. Supplemental information concerning equipment, performance, safety, reliability, maintainability, warranty program and any other literature (including pictures) would be useful in this market survey.

NOTE: Your participation in this survey is voluntary and the U.S. Army will not pay for any information provided.

1. General Information

a. Manufacturer :

1. Name : _____
2. Mailing Address : _____
3. Plant Location : _____

b. Individual(s) Responding to Questionnaire :

1. Name : _____
2. Title : _____
3. Company Position : _____
4. Telephone Number : _____

2. Capability :

- a. Are you a manufacturer of roller straightening equipment?
If not, list possible sources of equipment manufacturers from whom you would purchase equipment for this effort.
- b. Is the roller straightening equipment you propose manufactured in the United States/Canada? If not, where?

- c. What are the operational Capabilities/Specifications of the roller straightening equipment you propose?
- d. What is the life expectancy of the roller straightening equipment when used at a rate of a million or so pins per year?
- e. Describe the automated features of your proposed roller straightening equipment.
- f. How will equipment maintenance support and parts supply be provided?
- g. What is the mean time between failures and what is the mean time for repair?
- h. What do you propose in the way of backup equipment for straightening pins during down time of roller straightening equipment in order to avoid delays in production?
- i. What are the equipment and operational costs of your proposed roller straightening equipment?
- j. Does the operation of the roller straightening equipment meet OSHA standards for safety and health?
- k. What lead time, if any, is required for acquisition of roller straightening equipment?
- l. What are the skill level and training requirement for operations and maintenance of the roller straightening equipment?
- m. Are there any special equipment requirements for operation calibration or maintenance of the roller straightening equipment?
- n. Describe adaptability of proposed equipment to roller straighten pins for other tracked vehicles (e.g. M60 tank, M2 Bradley Fighting Vehicle, etc.).
- o. Identify type and extent of equipment warranties provided.

3. Knowledge :

- a. How is your company organized and approximately how many technical personnel are in each department? Furnish organizational charts, if available, and geographic locations.

- b. Describe your knowledge of roller straightening operations. Describe benefits of roller straightening over conventional chisel straightening (straightening via 3-point bend). List your knowledge of present users of the roller straightening process, their application and results/benefits realized.

4. Experience :

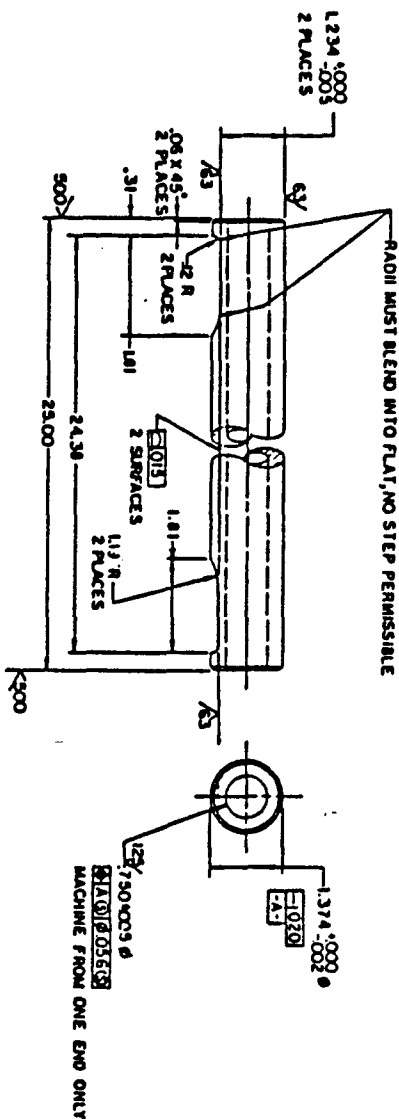
- a. Has your company ever been responsible for the establishment of an in-plant roller straightening operation that would meet or exceed requirements for straightening track pins shown in enclosed drawing of subject or similar pins? If so:

- I. Please give detailed description and include photographs.
- II. What was the yearly rate of items straightened?
- III. What was the equipment history of reliability/availability?

If not, what plans/capabilities do you have to accomplish said task?

- b. Has your company had production contracts or contracts involving establishment of new processing methods in plants serving the U.S. Government? If so, please list two such contracts, contract numbers, agencies involved and items/capabilities supplied, provided or established.

| REV | DATE | BY | CHKD | DESCRIPTION |
|-----|----------|----------|----------|----------------------------|
| 1 | 12/27/48 | W. J. K. | W. J. K. | REWORK WITHOUT CHANGE |
| 2 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 3 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 4 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 5 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |



9. QUALITY ASSURANCE REQUIREMENTS
DARS APPLY TO THIS DRAWING.
DAN NO. SAME AS PART NO.

7. REMOVE ALL BURRS AND SHARP EDGES

6. IF STRAIGHTENING IS REQUIRED IT
MAY BE PERFORMED AT
ROOM TEMPERATURE

5. SHOT PEEN ENTIRE PN, EXCEPT ENDS MAY BE UNPEENED,
PER SPEC MIL-S-13165 TO 010A TO 020A,
93% MINIMUM COVERAGE MEASURED
BY POLISHED ARC HEIGHT STRIP

4. SURFACE ROUGHNESS VALUES ARE
PRIOR TO SHOT PEENING

3. NO TOTAL AND NOT MORE THAN .003 PARTIAL
DECARBURIZATION PERMITTED BEFORE SHOT PEENING

2. HEAT TREATMENT:

AS QUENCHED AND TEMPER
AS TEMPERED HARDNESS 92 RC MIN
AS TEMPERED HARDNESS 40/45 RC

1. MATERIAL:
STEEL ALLOY BAR 8650H
SPEC ASTM A322 OR A331.

NOTES:



| REV | DATE | BY | CHKD | DESCRIPTION |
|-----|----------|----------|----------|----------------------------|
| 1 | 12/27/48 | W. J. K. | W. J. K. | REWORK WITHOUT CHANGE |
| 2 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 3 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 4 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |
| 5 | 12/27/48 | W. J. K. | W. J. K. | W. J. K. REWORK 30mm 10010 |

12274418

U.S. ARMY TANK AUTOMOTIVE COMMAND

WHEEL, REAR, RIGHT DRIVE

PIN

0 19207 12274418

APPENDIX C
SCORING MATRIX

| | | SCORING | MATRIX | | |
|--|--------------------|---------|--------|---------------|---------------|
| | | TRACK | PIN | ROLLER | STRAIGHTENING |
| ===== | | | | | |
| CATEGORY | | FACTOR | | RATING (1-10) | SCORE |
| 1. General Information | | | | | |
| Name | PERFECT CONTRACTOR | | | | |
| Address | ONE UTOPIA ROAD | | | | |
| Title | PRESIDENT | | | | |
| Phone | 1-(800)-**** | | | | |
| 2. Capability | | | | | |
| a. Equipment Mfr?/List? Manufacturer (Y/N) Listing | | 5 | | 10 | 50.00 |
| b. Origin of Equipment United States Canada Germany Japan Other | | 3 | | 10 | 30.00 |
| c. Operational Capabilities/Specs | | 10 | | 10 | 100.00 |
| d. Life Expectancy | | 5 | | 10 | 50.00 |
| e. Automated Features | | 6 | | 10 | 60.00 |
| f. Maintenance Maintenance Support Parts Supply | | 9 | | 10 | 90.00 |
| g. Machinery Statistics Mean time between failure Mean time for repair | | 10 | | 10 | 100.00 |
| h. Backup | | 6 | | 10 | 60.00 |
| i. Costs Equipment Operational | | 6 | | 10 | 60.00 |
| j. Safety Meets OSHA Standards | | 6 | | 10 | 60.00 |
| k. Acquisition Lead Time Requirement | | 6 | | 10 | 60.00 |

| | | | |
|-------------------------------|----|----|---------|
| 1. Skills Requirement | 6 | 10 | 60.00 |
| Equipment Operation | | | |
| Equipment Maintenance | | | |
| m. Special Requirements | 4 | 10 | 40.00 |
| Equipment Operation | | | |
| Equipment Calibration | | | |
| Equipment Maintenance | | | |
| n. Adaptability | 9 | 10 | 90.00 |
| o. Warranties | 3 | 10 | 30.00 |
| p. Additional Info. Furnished | 5 | 10 | 50.00 |
| 3. Knowledge | | | |
| a. Organizational | 7 | 10 | 70.00 |
| Technical Persons | | | |
| Organizational Chart | | | |
| Location | | | |
| b. Knowledge | 10 | 10 | 100.00 |
| Benefits over chisel | | | |
| List of present users | | | |
| Applications/Benefits | | | |
| 4. Experience | | | |
| a. Establishment In-plant | 10 | 10 | 100.00 |
| Actual | | | |
| Description | | | |
| Rate | | | |
| Reliability | | | |
| Planned (if no actual) | | | |
| b. Production Contracts | 6 | 10 | 60.00 |
| 2 or more contracts | | | |
| Only one contract | | | |
| No contracts | | | |
| Capability Provided | | | |
| TOTAL SCORE | | | 1320.00 |

APPENDIX D

NOTIFICATION OF SURVEY COMPLETION

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

HB 30 Oct 88
info - FMC
Stan C

REFERENCE OR OFFICE SYMBOL

AMSTA-IRDA (715k)

SUBJECT

Market Survey, Track Pin Roller Straightening

TO

Act C, Mfg Tech
& Prod Div (AMSTA-TM)

FROM

C. Rsch. Dev & Engr
Proc Sec A (AMSTA-IRDA)

DATE

SEP 29 1988

CMT 1

Mr. Smith/aas/48574

1. No other responses to the Market Survey are expected. All other firms which have not responded have been contacted and have indicated they would not be participating.
2. POC is Mr. Mark Smith at X48574.

John Cash
JOHN CASH

C. Rsch. Dev & Engr Proc Sec A

APPENDIX E

QUESTIONNAIRE REPLY (AMERICAN ANALYTICAL CORP)

American Analytical Corporation

37985 BUTTERNUT RIDGE ROAD

ELYRIA, OHIO 44035

Telephone (216) 458-8222

FAX 216-531-8066

Telex 980131

July 14, 1988

Mr. John Cash
Chief, Research, Development and
Engineering Procurement Section A
DEPARTMENT OF THE ARMY
United States Army Tank-Automotive Command
Warren, Michigan 48397-5000

Dear Mr. Cash,

We appreciate the opportunity to submit this response to your survey request.

Due to the limited amount of technical availability, most of the responses are generated from experience with axle straightening. As I pointed out in the survey, the pin improvement is one facet, but the ability to break marginal pins prior to further processing would be significant. At this point we have no idea as to the amount, eventually I would suggest a sample run of new pins be roller straightened to test the theory.

I look forward to the opportunity to assist in improving part quality and life expectancy. Thank you.

Sincerely,
AMERICAN ANALYTICAL CORPORATION

Charles Lambricht

Charles Lambricht
President
CJL/sl

Enclosure

American Analytical Corporation

37985 BUTTERNUT RIDGE ROAD

ELYRIA, OHIO 44035

Telephone (216) 458-8222

FAX 216-531-8066

Telex 980131

July 14, 1988

Mr. John Cash
Chief, Research, Development and
Engineering Procurement Section A
DEPARTMENT OF THE ARMY
United States Army Tank-Automotive Command
Warren, Michigan 48397-5000

Subject: Market Survey, Track Pin Roller Straightening Capability

Survey Response

1. General Information

a. Equipment Manufacturer

1. Cargil Detroit Corporation
Metallworking Division
1250 Crooks Road
Clawson, MI 48017

- b. 1. Charles Lambright
President
American Analytical Corporation
216-458-8222

2. Capability

- a. No
Cargil Detroit Corp. is one potential supplier.
- b. Yes
- c. To be obtained from Cargil Detroit Corp.
- d. Per Cargil Detroit Corp. 20 years
- e. To be determined
- f. Per Subcontractor and Cargil Detroit Corp.
- g. Estimated one to two days/per Cargil Detroit Corp.
- h. Not determined
- i. Equipment cost estimated to be \$480,000.00,
operational cost to be determined.
- j. Yes, per Cargil Detroit Corp.
- k. Eight to nine months

1. Unskilled
- m. American Analytical Corporation purchase recommended on availability to Fastress* Residual Stress Analyzer and Electropolishing Equipment. Estimated cost \$95,000.00, three to four months delivery.
- n. Proposed equipment is well suited to track pins.
- o. Warranties for all proposed equipment is 12 months.

3. Knowledge

- a. Cargil Detroit Corp. is a major domestic supplier of Roller Straightening Equipment.

American Analytical Corporation is a major supplier of X-Ray Residual Stress Measurement Equipment and associated with Mr. Ken Spray, Master Degreed Metallurgist, retired from Clark Equipment Company Corporate Laboratories.

The only people associated with this proposal are Charles Lambright and Mr. Ken Spray.

- b. Roller straightening is an accepted industrial process, used in a variety of applications, much work has been done and is being contemplated by the axle industry. The principle purpose is to straighten warped or bent shafts, pins, or some tubular parts. Very little technical information seems to be available. Most equipment seems to be evaluated and if the parts are straightened, then the process is acceptable.

Some brief general comments have been published as to metallurgical and cold work characteristics, but from some limited stress measurements and consensus, we believe that all parts should be rolled to provide a uniform cold worked surface layer to improve the overall mechanical properties. The proposed use of residual stresses, surface or subsurface would provide the Quality Control process needed.

From the experience of Mr. Ken Spray at Clark and my observations, a major value of straightening is the accept-reject mode. Over the last 10 to 15 years of working with Mr. Catalano of TACOM and stress measurements for peened track pins, and contributions to research done at Case Western University, Cleveland, Ohio, I am aware of one of the modes of failure in the track pins. Mr. Ken Spray performed some courtesy work for me on several sections of failed track pins. He observed that on several fatigue tested track pins,

Mr. John Cash
July 14, 1988
Page -3-

that most all of the failure originated at occlusions in the steel. On a new unused pin, metallurgically sectioned and observing the heat affected zones between the OD and ID, cracks as long as 0.100" radiated from the steel occlusions. Based on typical metal failure, we believe some pins will fail prematurely. Likewise, if these type pins were roller straightened a certain number will break during straightening. Therefore, the procedure would be used for sorting those potentially bad pins.

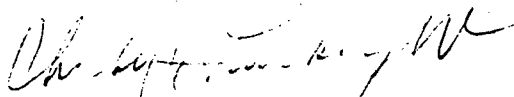
Straightening via 3 point bend does not induce a uniform layer of cold work to the pins, and may well induce undesirable nonuniform surface stresses. If the cracks mentioned above are not positioned to open up under bending, you obtain selective sorting and the induced bending is not uniform.

After a modest amount of research, we could demonstrate that a roller straightened pin would last longer and marginally produced pins would be rejected and pin uniformity would be improved.

4. Experience

- a. No
American Analytical Corporation and Mr. Ken Spray propose to work with TACOM and a Subcontractor or track builder to develop the control parameters and setup criteria to accomplish the recommended results.
- b. No
We are awaiting an opportunity to supply equipment to a track supplier to meet residual stress specifications on M-60 track pins. We have worked with TACOM and Firestone Tire & Rubber Co. in establishing such specifications.

Sincerely,
American Analytical Corporation



Charles Lambright
President
CJL/sl

*T.M. of General Motors Corporation

CARGILL DETROIT
Corporation



EST. IN 1949

● 1200 HAMLIN ROAD • ROCHESTER HILLS, MICHIGAN 48063 • (313) 656-2920 • TELEX 23-1116

We are pleased to submit, for your consideration, our proposal for a Cargill Detroit system. This system, which covers items you have requested, will straighten and gage your forged and extruded axle shafts. Description and operational sequence are enclosed.

This system represents the most economical and efficient method of straightening and gaging your axle shafts.

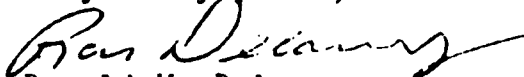
Cargill Detroit systems eliminate the need for operator technique, thus allowing the use of unskilled labor.

Cargill Detroit's automatic straightening not only straightens the part, but through its unique process enables the part to be stabilized.

Note: See attached sheets for content of system and production rate.

Thank you for this opportunity to be of service to you. We look forward to working with you on this project.

Very truly yours,


Ronald W. Delaney
Sales Manager
Metalworking Division

RWD:ee
Enclosures

E-7



QUOTATION

STATION DESCRIPTIONS & SEQUENCE OF OPERATIONS

Accumulative Loader

(5) Part Accumulative Loader: The loader holds (5) parts and when one part is picked off the end, the parts automatically move forward permitting operator to load new parts as needed.

Stres-A-Liner Straightener - Model 300-40-48
(Part Rotating)

The basic machine consists of a rigid heavy duty base, bridge, columns, ram, "floating" chuck, hydrastatic drive, action and reaction rolls. The floating chuck drive assembly is powered by a hydrastatic drive and provides 7,500 in pounds of turning torque to the part. The ram, with action rolls attached, produces a maximum of 40,000 pounds of dynamic displacement force. The rate of displacement of the ram is positive. The rate of displacement can be quickly changed to accommodate a family of parts. Taking the resultant force are the reaction rolls which are mounted on hardened and ground replaceable type ways. The rolls contain anti-friction bearings, made of high quality alloy steel, hardened and ground for maximum life.

Gage Station - T.I.R.

This unit will consist of a rigid base weldment of machine tool quality normalized and stress relieved. Mounted on the base will be three slide units that are adjustable for various part lengths.

A T.I.R. gage unit will be mounted on center slide with a roll unit mounted on each end slide.

A motor with drive wheel will be mounted on slide to top bridge to rotate part for the T.I.R. check.

After the part is gaged, part is transferred out of the station. If the part is within tolerance the part continues through onto exit rails. If the part is out of tolerance, it will stop at reject station.

Reject Station

Upon receipt of signal from the Gaging Station, an out of tolerance part is stopped in reject station and lifted onto a reject roller chute and stored until removed by operator. Parts that are in tolerance continue to the unload position.



PART DELINEATION

Part Name: Forged and Extruded Axle Shafts
with range of the following part numbers.

Part Numbers: 07470105, 07470106, 07470110, 14035355,
361733, 7470114

Part Material: 1050 Modified as Forged

The straightening tolerance will be held to .020 T.I.R., plus ovality, when the out of straightness tolerance as received by straightener is within .100 to .120 T.I.R.

CONTROLS

Lubrication

The system is equipped with an automatic centralized lubrication unit to protect all bearings and wear surfaces. Our unit provides positive lubrication at each lube point at predetermined intervals.

Hydraulic

The hydraulic system is completely self-contained and built to JIC standards. It supplies oil at proper pressure and in sufficient quantities to all hydraulic equipment. For ease of adjustment and maintenance, valves and controls are manifold mounted.

Electrical

The electrical system is completely self-contained and built to JIC standards. It contains all the components and circuitry required for the proper functioning of this equipment. The control panel and machine are wired for 460 Volt. The controls are wired for 110 Volt, 3 Phase, 60 Hertz.



CARGILL DETROIT

Corporation

PART PRODUCTION

Your request for quotation inquiry No. 1402-F-88 indicates your minimum cycle time requirements are 6 axles per minute or 10 second cycle time.

Our straightener is capable of running at cycle rates indicated, however, we cannot guarantee that parts can be consistently straightened within this cycle time due to the following:

It has been our experience over the years that extruded axles have been more consistent than forgings; therefore, it would be more likely that extruded axles could be straightened at the requested rate. However, we have no control of the material, and over the built-in stress within the axles prior to straightening; therefore, we cannot guarantee the production rate requested. We can only guarantee the machine cycle rate capability. It is possible that this may require (2) straighteners to assure that the requested 6 axles per minute production rate be maintained.



GENERAL CONDITIONS AND NOTES

Warranty

I. Cargill Detroit Corporation warrants equipment manufactured by it to be free of defects in workmanship and material for a period of twelve months from the date of shipment. The warranty for purchased components used in the construction of equipment is that of the component's manufacturer.

Cargill Detroit Corporation's warranty extends only to the original purchaser and is valid only if: (1) notice of any claimed defect is received by Cargill within the warranty period, (2) Cargill Detroit Corporation personnel have inspected the equipment while the equipment is in the claimed defective condition, (3) the equipment has been properly used and maintained.

If Cargill Detroit Corporation determines any item to be defective, Cargill may, at its option, (1) repair the item, at Cargill's expense, to the warranted condition, or (2) supply a comparable item F.O.B. Cargill's plant in Rochester Hills, Michigan. If Cargill so elects, the warranty period on the repaired or replacement item shall be the balance of the warranty on the original item.

II. The foregoing responsibility of Cargill Detroit Corporation to repair or replace defective items shall be the customer's sole and exclusive remedy for any defect or failure of performance of items manufactured or supplied by Cargill Detroit Corporation.

III. Other than as specifically set forth above, Cargill Detroit Corporation extends no warranties, express or implied, including any WARRANTY OF MERCHANTABILITY or WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, with respect to any items manufactured or supplied by Cargill Detroit Corporation.

Limit of Liability

Cargill Detroit Corporation will not be liable for any incidental, consequential or similar damages resulting from or arising out of any defect or failure of any item manufactured or supplied by Cargill Detroit Corporation, including by way of illustration and not of limitation, damages for injury to persons or property, labor costs, lost revenue and expenses of delay.

Terms

Upon approved credit, 90% of the total amount shall become due and payable upon shipment from our plant. 10% of the total shall become due and payable upon acceptance of the machine by the purchaser. The purchaser will make their part acceptance run within a period of sixty (60) days from shipment. In the event that, due to conditions beyond the control of Cargill Detroit, the acceptance run is delayed beyond ninety (90) days from shipment, the 10% balance shall become due and payable.



General Terms and Conditions Continued

Terms Continued

Orders placed against this quotation cannot be cancelled with loss to Cargill Detroit Corporation. Cargill Detroit Corporation cannot be held liable for conditions beyond its control.

Please note that work stoppages and changes, caused by the purchaser could entail increased costs which would accrue to the purchaser.

Standards

This system has been quoted to Cargill Detroit Corporation Standards.

Machine Tryout Prior to Shipment

The equipment will be demonstrated for Buyer's acceptance to prove compliance with proposal requirements by running the equivalent of one (1) hours production on a sustained basis. When part size, bulk and/or weight are of such character as to preclude a sustained run due to in-plant logistics, time cycle capability will be proven by Event Recorder graphically displaying all elements of the time cycle.

Proprietary Information

Our proposal is based on your specifications wherever possible, but with our metalworking approach we may be able to develop alternatives to these specifications which may provide a better system. We ask that these approaches be considered proprietary when requesting requotes or in awarding a purchase order.

Drawings

Drawings on Cargill paper will remain the property of Cargill Detroit Corporation. Sepias will be furnished on all assemblies and sub-assemblies. Tracings on customer's paper of Perishable Tooling, Electrical, Hydraulic, Pneumatics and Lubrication Systems will be turned over to the customer.

O.S.H.A.

O.S.H.A. Standards will be adhered to as we understand their application to Cargill Detroit Corporation, Metalworking Division, equipment. Safety color codes for marking physical hazards will be adhered to per OSHA regulations. The machine will be painted one primary color. Multicolors are available at additional costs.

Guarding

Standard guarding is provided. Special guarding can be provided at extra cost.

Floor Plan

Floor Plan Layout No. MD-1292-A is enclosed.

Designers and Builders of Automatic Manufacturing Systems



CARGILL DETROIT

Corporation

FIELD SERVICE CHARGES (CHARGES - EFFECTIVE AUGUST 1, 1985)

Cargill Detroit service personnel are available to you on service problems with your equipment. Charges for service beyond our normal warranty are made in accordance with the following schedule:

I SERVICE CHARGES

Minimum Charges for Week Day Work During Normal Hours

- a. Up to five (5) hours including travel time. \$305.00
- b. Over five (5) hours but not in excess of ten (10) hours including travel time. (Excluding 1/2 hour for lunch). \$635.00
- c. Hours worked in excess of ten (10) will be charged at \$ 91.00/hr

Minimum Charges for Saturday Work During Normal Hours

- a. Up to five (5) hours including travel time \$420.00
- b. Over five (5) hours but not in excess of ten (10) hours including travel time. (Excluding 1/2 hour for lunch). \$830.00
- c. Hours worked in excess of ten (10) will be charged at the rate of \$ 91.00/hr

For Sunday and Holiday Work

- a. For all hours, including travel time on Sundays, Legal Holidays and holidays observed by Cargill Detroit Corporation \$115.00/hr
- b. Minimum charge \$565.00

II FIELD SERVICE RATES SUBJECT TO CHANGE WITHOUT NOTICE

III EXPENSE CHARGES

For actual travel and living expenses incurred by our employee and including weekend returns to home base on extended calls.

Cost + 10%

IV PURCHASE ORDERS

All requests for field service must be confirmed by a purchase order.

V MATERIAL AND REPLACEMENT PARTS

Material and replacement parts are NOT included in the aforementioned rates.



FIELD SERVICE CHARGES (CHARGES - EFFECTIVE AUGUST 1, 1985)

Cargill Detroit service personnel are available to you on service problems with your equipment. Charges for service beyond our normal warranty are made in accordance with the following schedule:

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Cost + 10%

IV PURCHASE ORDERS

All requests for field service must be confirmed by a purchase order.

V MATERIAL AND REPLACEMENT PARTS

Material and replacement parts are NOT included in the aforementioned rates.



I T E M I Z E D Q U O T A T I O N

| <u>Item</u> | <u>Qty.</u> | <u>Description</u> | <u>Price</u> |
|--|-------------|--|---------------|
| 1 | 1 | (5) Part Accumulative Loader | \$ 11,705.00 |
| 2 | 1 | Stres-A-Liner Model 300-40-48 Complete With Controls & (1) Set of Upper Rolls (2 Braackets With (2) Rolls Each), (1) Set of Lower Rolls (2 Braackets With (2) Rolls Each), & Chuck (Less Chuok Jaws) | 213,390.00 |
| 3 | 1 | T.I.R. Gage Station Complete With Controls | 77,470.00 |
| 4 | 1 | Reject Station With 9 Feet of Track Complete With Controls | 58,255.00 |
| 5 | 1 | Walking Beam Transport (as Shown on Floor Plan) | 79,500.00 |
| 6 | 1 | System Integration | 38,290.00 |
| TOTAL FOR ONE SYSTEM WITH 360/HOUR CAPACITY: (See sheet describing part production) | | | \$ 478,610.00 |
| TOTAL FOR SECOND SYSTEM (If desired) | | | \$ 454,680.00 |

Spare tooling and parts will be quoted after receipt of order and approval of drawings.

APPENDIX F

QUESTIONNAIRE REPLY (SUMMERBELL CO.)



WILLIAM E. SUMMERBELL CO.

P.O. Box 2564 • Arlington, Virginia 22202-0564 • (703) 979-4800

July 13, 1988

Mr. John Cash
U.S. Army Tank-Automotive Command
Section A
Warren, MI 48397-5000

Subject: Market Survey
Track Pin Roller Straightening Capability

Dear Mr. Cash:

Attached is a copy of a letter I recieved from Cosa regarding the above Market Survey. Cosa's letter outlines their capabilities.

I would like to visit the Army along with Mr. Scheurle to discuss the operation of the Galdabini straightener. We would be discussing production capabilities, a demonstration of a machine and other important items.

I will call you the week of July 18th.

Sincerely,

William E. Summerbell
William E. Summerbell

cc: Cosa Corporation Clem Scheurle

encl: Department of the Army letter Dated June 24, 1988
Cosa letter Dated July 11, 1988
Copy of the answered Track Pin Survey
2 Cosa reference lists dated July 1, 1988
2 Galdabini Catalogs



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY

UNITED STATES ARMY TANK AUTOMOTIVE COMMAND
WARREN, MICHIGAN 48397-5000

JUN 24 1988

AMSTA-IRDA

SUBJECT: Market Survey, Track Pin Roller Straightening Capability

Mr. William E. Summerbell
William E. Summerbell Company
Post Office Box 2564
Arlington, Virginia 22202-2564

Dear Mr. Summerbell:

Attached is a copy of the Market Survey as advertised in the Commerce Business Daily on June 10, 1988. The Market Survey is for potential roller straightening equipment..

It is requested that your firm respond to the Market Survey to the best of its ability. It is asked that your firm respond to this Market Survey as soon as possible, so that a review by the Government can be accomplished to determine the availability of equipment that can or could be adapted to straighten warped M1A1 track pins.

Should you have any questions, please contact Mr. Mark Smith at (313) 574-8574.

Sincerely,

John Cash
Chief, Research, Development and
Engineering Procurement Section A

Attachment

COSA CORPORATION



17 PHILIPS PARKWAY / MONTVALE, NEW JERSEY 07645/(201) 391-0700
TELEX: ITT-422081 (U.S. Prefix No. 71) Telefax: (201) 391-4261

July 11, 1988

Mr. William E. Summerbell
William E. Summerbell Company
P.O. Box 2564
Arlington, Virginia 22202-2564

Re: Market Survey
Department of the Army
Roller Straightening Equipment

Dear Bill:

As discussed, please find attached our responses typed on the original questionnaire form from the Army.

Also enclosed, are (2) each catalogs and reference lists.

Please submit our answers to John Cash and find out whether there is interest in our Galdabini straightener, which is not the roll-straightening type requested.

Very truly yours,

COSA CORPORATION

Clemens P. Scheurle
Product Manager

CPS:1
encs.

July 1, 1988

REFERENCE LIST - USA

USERS OF GALDABINI MANUAL STRAIGHTENING PRESSES

| | |
|---|-------|
| Whitin Machine Works, Shitinsville, MA. | 16 T |
| Brown & Sharpe, No. Kinston, RI. | 16 T |
| DeLaval, Trenton, NJ. | 50 T |
| Al Research, Los Angeles, CA. | 16 T |
| Electro Jet Tool Co., Cincinnati, OH. | 50 T |
| National Waterlift, Kalamazoo, MI. | 25 T |
| Pittsburgh Tubular Shafting, Rochester, PA. | 50 T |
| Harbison Fischer, Fort Worth, TX. | 25 T |
| D & D Gear Co., Whittier, CA. | 25 T |
| Sikorsky Aircraft, Stratford, CT. | 25 T |
| Reda Pump, TRW, Bartlesville, OK. | 160 T |

USERS OF GALDABINI AUTOMATIC STRAIGHTENING PRESSES

| | <u>No. of Machines</u> |
|---|------------------------|
| Nuclear Metals, Concord, MA. | 1 |
| Warner Gear Co., Muncie, IN. | 4 |
| Ford Motor Co., Indianapolis, IN. | 11 |
| Mercury Marine, Fond du Lac, WI. | 2 |
| Ford Motor Co., Connersville, IN. | 1 |
| Chrysler Corporation, Indianapolis, IN. | 2 |
| Chrysler Corporation, Syracuse, NY. | 4 |
| Ford Motor Company, Batavia, OH. | 2 |
| Stanadyne, Inc., Hartford, CT. | 1 |
| International Harvester, Hinsdale, IL. | 1 |
| Stanadyne, Inc. Bellwood, IL. | 1 |
| Ford Motor Company, Sharonville, OH. | 1 |
| Chrysler Corporation, Kokomo, IN. | 4 |
| Detroit Diesel Allison, GMC Div., Muncie, IN. | 2 |
| Perfect Punch, Chicago, IL. | 1 |
| Cosa Stock, Detroit Showroom | <u>1</u> |
| TOTAL | 40 |

July 1, 1988

REFERENCE LIST - USA

USERS OF GALDABINI MANUAL STRAIGHTENING PRESSES

| | |
|---|-------|
| Whitin Machine Works, Shitinsville, MA. | 16 T |
| Brown & Sharpe, No. Kinston, RI. | 16 T |
| DeLaval, Trenton, NJ. | 50 T |
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| National Waterlift, Kalamazoo, MI. | 25 T |
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| Harbison Fischer, Fort Worth, TX. | 25 T |
| D & D Gear Co., Whittier, CA. | 25 T |
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| Chrysler Corporation, Syracuse, NY. | 4 |
| Ford Motor Company, Batavia, OH. | 2 |
| Stanadyne, Inc., Hartford, CT. | 1 |
| International Harvester, Hinsdale, IL. | 1 |
| Stanadyne, Inc. Bellwood, IL. | 1 |
| Ford Motor Company, Sharonville, OH. | 1 |
| Chrysler Corporation, Kokomo, IN. | 4 |
| Detroit Diesel Allison, GMC Div., Muncie, IN. | 2 |
| Perfect Punch, Chicago, IL. | 1 |
| Cosa Stock, Detroit Showroom | 1 |
| TOTAL | 40 |

SURVEY OF TRACK PIN ROLLER STRAIGHTENING CAPABILITY

The purpose of this market survey is to determine the capability, knowledge and experience of existing firms to perform roller straightening of MIAI track pins in a manufacturing plant environment, as well as obtain an estimate of costs involved.

These track pins become warped due to heat treatment during manufacturing, and require straightening prior to further processing. A million or so pins per year require straightening. Therefore, automated handling is desired. The survey involves: selecting/pricing of required equipment; listing of equipment manufacturers capable of furnishing the equipment; listing of present users, applications and equipment used; determine impact roller straightening has on track pin fatigue life (and surface residual stress); and gathering information on possible sources interested in participating in a competitive bid to establish roller straightening capability of MIAI track pins in a third party plant.

Please answer all questions applicable to your capability, knowledge and experience. Supplemental information concerning equipment, performance, safety, reliability, maintainability, warranty program and any other literature (including pictures) would be useful in this market survey.

NOTE: Your participation in this survey is voluntary and the U.S. Army will not pay for any information provided.

1. General Information

a. Manufacturer :

1. Name : Galdabini c/o Cosa Corporation
2. Mailing Address : 17 Philips Parkway
Montvale, NJ 07645
3. Plant Location : Gallarate, Italy

b. Individual(s) Responding to Questionnaire :

1. Name : Clemens Scheurle
2. Title : Product Manager
3. Company Position : Product Manager
4. Telephone Number : (201) 391-0700

2. Capability :

- a. Are you a manufacturer of roller straightening equipment? If not, list possible sources of equipment manufacturers from whom you would purchase equipment for this effort.
- b. Is the roller straightening equipment you propose manufactured in the United States/Canada? If not, where?

ANSWERS:
No, we manufacture point to point flex straightening presses.

The presses are manufactured in Italy.

- c. What are the operational Capabilities/Specifications of the roller straightening equipment you propose? See catalog.
- d. What is the life expectancy of the roller straightening equipment when used at a rate of a million or so pins per year? 20 years.
- e. Describe the automated features of your proposed roller straightening equipment? Fully automated cycle double grip pick and place loader.
- f. How will equipment maintenance support and parts supply be provided? Through Cosa Corporation.
- g. What is the mean time between failures and what is the mean time for repair? No statistics available.
- h. What do you propose in the way of backup equipment for straightening pins during down time of roller straightening equipment in order to avoid delays in production? A second machine.
- i. What are the equipment and operational costs of your proposed roller straightening equipment?
- | | |
|---------------|------------|
| (Machine | \$235,000. |
| (Loader | \$ 83,000. |
| (Tooling | \$ 28,000. |
| (Engineering | \$ 27,000. |
- j. Does the operation of the roller straightening equipment meet OSHA standards for safety and health? Yes.
- k. What lead time, if any, is required for acquisition of roller straightening equipment? 12 months.
- l. What are the skill level and training requirement for operations and maintenance of the roller straightening equipment? General setup and maintenance personnel.
- m. Are there any special equipment requirements for operation calibration or maintenance of the roller straightening equipment? No.
- n. Describe adaptability of proposed equipment to roller straighten pins for other tracked vehicles (eg. M60 tank, M2 Bradley fighting Vehicle, etc.). Fully flexible.
- o. Identify type and extent of equipment warranties provided. 1 year, 1 shift.

3. Knowledge :

- b. How is your company organized and approximately how many technical personnel are in each department? Furnish organizational charts, if available, and geographic locations. Total 80 people. Locations are Montvale, N.J., Rochester, MI.

3. Describe your knowledge of roller straightening operations. Describe benefits of roller straightening over conventional chisel straightening (straightening via 3-point bend). List your knowledge of present users of the roller straightening process, their application and results/benefits realized.

ANSWERS:

We have excellent knowledge in flex straightening, giving very accurate results in continuous operation. User list enclosed.

4. Experience

- a. Has your company ever been responsible for the establishment of an in plant roller straightening operation that would meet or exceed requirements for straightening track pins shown in enclosed drawing of subject or similar pins? If so:

No.

I. Please give detailed description and include photographs.

II. What was the yearly rate of items straightened?

III. What was the equipment history of reliability/availability?

If not, what plans/capabilities do you have to accomplish said task?

Experience in straightening all kinds of automotive parts.

- b. Has your company had production contracts or contracts involving establishment of new processing methods in plants serving the U.S. Government? If so, please list two such contracts, contract numbers, agencies involved and items/capabilities supplied, provided or established.

No.

COSA CORPORATION

Clemens P. Scheurle
Clemens P. Scheurle
Product Manager

Dated: July 11, 1988

APPENDIX G

QUESTIONNAIRE REPLY (ROBERT C. REETZ CO.)

SURVEY OF TRACK PIN ROLLER STRAIGHTENING CAPABILITY

SMITH JR

The purpose of this market survey is to determine the capability, knowledge and experience of existing firms to perform roller straightening of M1A1 track pins in a manufacturing plant environment, as well as obtain an estimate of costs involved.

These track pins become warped due to heat treatment during manufacturing, and require straightening prior to further processing. A million or so pins per year require straightening. Therefore, automated handling is desired. The survey involves: selecting/pricing of required equipment; listing of equipment manufacturers capable of furnishing the equipment; listing of present users, applications and equipment used; determine impact roller straightening has on track pin fatigue life (and surface residual stress); and gathering information on possible sources interested in participating in a competitive bid to establish roller straightening capability of M1A1 track pins in a third party plant.

Please answer all questions applicable to your capability, knowledge and experience. Supplemental information concerning equipment, performance, safety, reliability, maintainability, warranty program and any other literature (including pictures) would be useful in this market survey.

NOTE: Your participation in this survey is voluntary and the U.S. Army will not pay for any information provided.

1. General Information

a. Manufacturer :

1. Name : Robert C. REETZ Company, Inc.
2. Mailing Address : P.O. Box 2245
Pawtucket, RI 02861
3. Plant Location : 190 York Avenue

b. Individual(s) Responding to Questionnaire :

1. Name : Richard C. Reetz, Jr.
2. Title : Vice President
3. Company Position : _____
4. Telephone Number : 401-722-9025

2. Capability :

- a. Are you a manufacturer of roller straightening equipment?
If not, list possible sources of equipment manufacturers from whom you would purchase equipment for this effort.
Manufacturer
- b. Is the roller straightening equipment you propose manufactured in the United States/Canada? If not, where?
United States

- c. What are the operational Capabilities/Specifications of the roller straightening equipment you propose?
Modified standard unit to meet all requirements
- d. What is the life expectancy of the roller straightening equipment when used at a rate of a million or so pins per year? Unknown at this time. We have units still in operation 25 yrs + from original installation.
- e. Describe the automated features of your proposed roller straightening equipment? All automation optional. Can include feed, roller settings, inspection.
- f. How will equipment maintenance support and parts supply be provided? Critical items will be stocked prior to operation. Non-critical items and service will be available
- g. What is the mean time between failures and what is the via in-house (RI) mean time for repair? support.
Not calculated at this time.
- h. What do you propose in the way of backup equipment for straightening pins during down time of roller straightening equipment in order to avoid delays in production? Critical components should be stocked (work, feed drive components). Unit can operate manually if required.
- i. What are the equipment and operational costs of your proposed roller straightening equipment? Cost of equipment is \$250-1,000,000 dependent on options- level of automation. 1 man
- j. Does the operation of the roller straightening equipment operation meet OSHA standards for safety and health? Yes
- k. What lead time, if any, is required for acquisition of roller straightening equipment? 6-18 months dependent on level of automation
- l. What are the skill level and training requirement for operations and maintenance of the roller straightening equipment? Basic electrical, hydraulic, mechanical knowledge.
- m. Are there any special equipment requirements for operation calibration or maintenance of the roller straightening equipment? No
- n. Describe adaptability of proposed equipment to roller straighten pins for other tracked vehicles (eg. M60 tank, M2 Bradley fighting Vehicle, etc.). Adaptable via change in rollers and control program if automated.
- o. Identify type and extent of equipment warranties provided. 1 year parts and labor extended at additional cost.

3. Knowledge :

- b. How is your company organized and approximately how many technical personnel are in each department? Furnish organizational charts, if available, and geographic locations. Organizational chart attached. Present locations in Pawtucket, RI and Long Beach, CA.

- b. Describe your knowledge of roller straightening operations. Describe benefits of roller straightening over conventional chisel straightening (straightening via 3-point bend). List your knowledge of present users of the roller straightening process, their application and results/benefits realized. Attached

4. Experience :

- a. Has your company ever been responsible for the establishment of an in plant roller straightening operation that would meet or exceed requirements for straightening track pins shown in enclosed drawing of subject or similar pins? If so: No

I. Please give detailed description and include photographs.

II. What was the yearly rate of items straightened?

III. What was the equipment history of reliability/availability?

If not, what plans/capabilities do you have to accomplish said task? Established (1899) financial stable organization

- and management capable of establishing in-house or pilot
b. Has your company had production contracts or contracts plant operation involving establishment of new processing methods in plants serving the U.S. Government? If so, please list two such contracts, contract numbers, agencies involved and items/capabilities supplied, provided or established.
not applicable

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BEST AVAILABLE COPY



Robert C. REETZ Company, Inc.

Equipment for handling metals and other materials

3.b.

The precision straightening of round bars uses a rotary-type straightening machine which polishes the surface as well as straightens the stock. This type of machine is a multiroll machine with the rolls angularly disposed to the workpiece and generally concave in shape so as to create the rotation of the piece being straightened. Multiple rolls are employed to insure good results in less time.

Conventional chisel straightening is also used for round bars. Usually when the bars are too long to rotate. Generally the rolls are formed to fit the periphery of the stock and are in two planes with from 7 to 10 rolls in each plane. The quality of the straightened bars is not quite as good as when the piece is permitted to rotate.

SUBJECT:

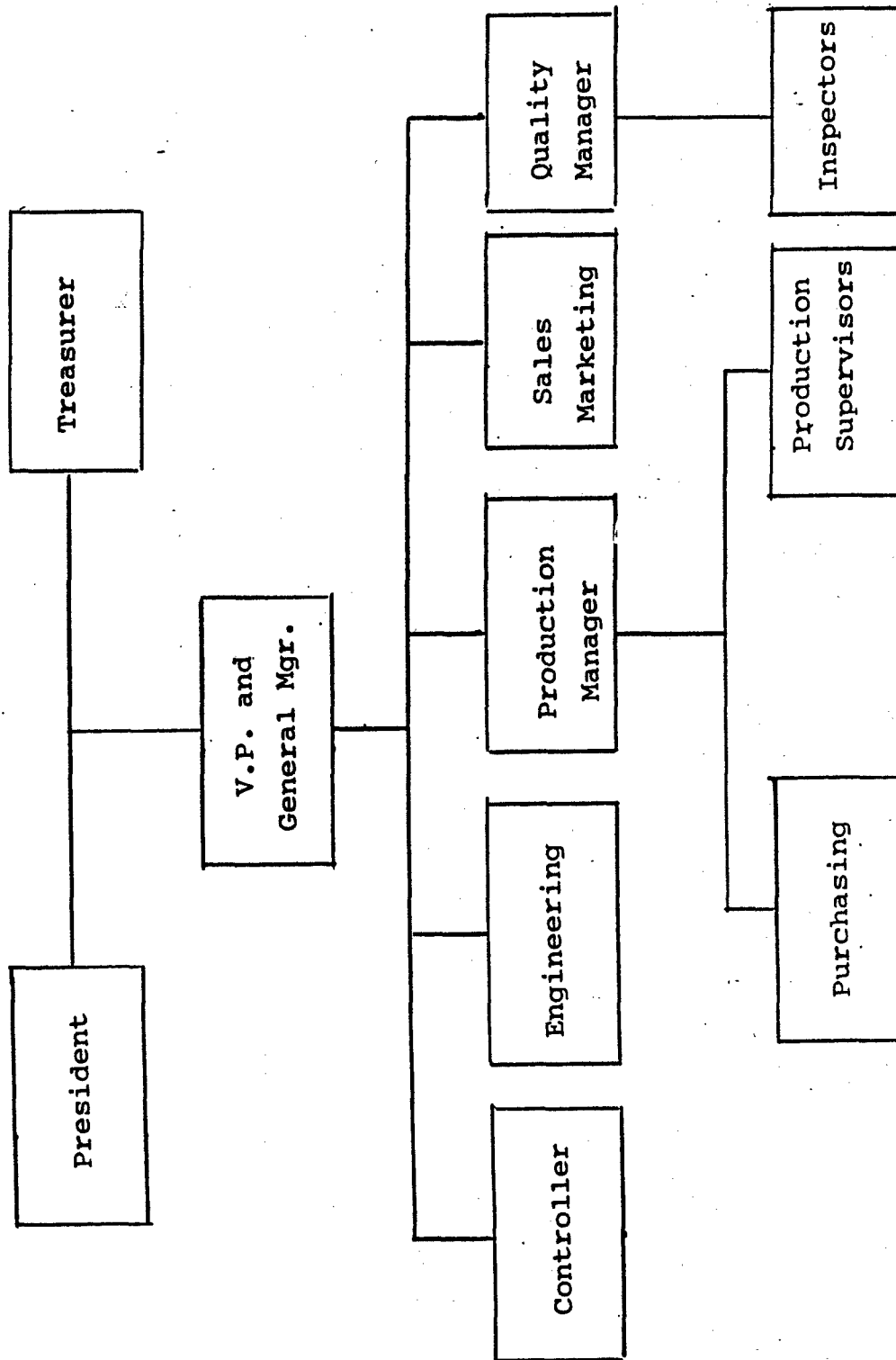
ORGANIZATION CHART

Effective Date
10/1/86

Number
Appendix A

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Revision B



APPENDIX H
QUESTIONNAIRE REPLY (KUMMERT TOOLS FOR INDUSTRY, INC.)

KUMMERT TOOLS FOR INDUSTRY, INC.

P.O. Box 114

BALDWINVILLE, NEW YORK 13027

(315) 638-8965

TO

US Army Tank
Warren, Mich. 48397-5000
Mr. John Cash

DATE

9/12/88

SUBJECT

straightening Presses
for Tank Track Pin

Mr. Cash:

Enclosed is an article which may interest you + your Engineering Dept. on subject of Track Pin Straightening. If slots or holes are in the end of Pins. Roller will distort same, where as the Machine enclosed will not.

Please let us know if we can be of further service.

SIGNED

Wm. Kummert



PLEASE REPLY



NO REPLY NECESSARY

Automated straightener eliminates bottleneck

A Blairsville, Pa., machining firm brought its straightening rate from 75 to 250-300 shafts per hour with a unit that has experienced less than 1% downtime since 1983 and paid for itself within the first two years.

by RICHARD CREAL

In the early eighties, the straightening department of the Blairsville (Pa.) Machine Products Co. became the scene of a serious bottleneck in the production of link pins for tank tracks, one of the firm's major ongoing projects.

A vital part for the pins—an SAE 8650 cold finished steel shaft measuring 28 inches long x 1 1/4-1 3/8 inches in diameter—was being straightened manually at 75 per hour when a rate of 250-300 per hour was needed to keep pace with the other operations.

L. Harold Kirkell, founder and president of the 42-year-old subcontract production machining firm,

decided in 1983 that the straightening department should have top priority in his systematic plan to automate all aspects of production. But when he began shopping around for an automatic straightening machine, he was disappointed. Every machine he looked at was a rotary straightener that invariably twisted the two broached grooves at the ends of each shaft out of parallel.

Then he found an automatic straightening press, and he had what he needed: automation without the twisting problem. The unit, which he subsequently purchased, is an Eitel Universal ASP-25-3/5 with Gould-

Modicon control and automatic testing. Kirkell added an automatic loading/unloading mechanism of his own design.

The bottleneck completely disappeared. The straightening rate jumped to the needed 250-300 shafts per hour, and the machine has been running 24 hours a day, five days a week ever since with less than 1% downtime for maintenance. At this rate, Kirkell says, the \$200,000 straightener paid for itself in the first 18 months to two years.

Two straightenings

Straightening takes place after two salt bath heat treatments. The first treatment, which core hardens the shaft to 40-45 Rockwell C, is followed by a straightening to .015-inch TIR (total indicator reading). The second treatment, a case hardening to 55-60 RC, is followed by straightening to .010-inch TIR, well within the requirement of .020-inch TIR for the finished part.

The Eitel machine, which can be programmed for a tolerance as tight as .001-inch TIR, has no problem meeting any of the specs.

For that matter, Kirkell notes, neither did the human straighteners, but they needed a high degree of skill and too much time to do it. "A rate of 75 shafts per hour comes to 600 per shift, and that's a darn good shift for a hand straightener," says Kirkell. "He has to be pretty adept to do that. But with this machine, all you have to do is train somebody to push buttons."

To keep the machine running at 250-300 shafts per hour, Kirkell has programmed it to spend no more than 14 seconds to straighten one shaft. For 92% of the parts, this is

"...stressing automation from day one"

Harold Kirkell has been a believer in automation ever since he founded Blairsville Machine Products in August 1945. "We've been stressing automation from day one," he says. "My dream would be to have someone sit in the front office and push buttons."

He says he's constantly looking for opportunities to automate and has pretty well achieved automation for individual pieces of equipment. However, he acknowledges that running the entire operation by pushing buttons in his office is not a realistic goal because of the inherent difficulties in materials handling.

"Material handling doesn't lend itself to automation here," he says.

"We process a lot of different parts of different sizes requiring different things to be done to them. It's very difficult to dedicate any set of machines here to anything."

Blairsville Machine produces a wide variety of parts from bar stock for a number of different industries. On the shop floor are cut-off machines, screw machines, threading equipment, broaching machines, centerless grinding machines, salt bath heat treating furnaces, induction hardening units and straighteners. Kirkell says the firm has a production capacity of two tons per hour.

Almost all the equipment is now run with programmable controllers.—RC



Above: Blairsville's Eitel line with Gould-Modicon control runs 24 hours a day, five days a week. **Right:** Automatic unloading device of Kirkell's own design stacks shafts on a skid. **Far right:** Shafts enter the machine to be straightened or rejected within 14 seconds.

Automated

easily accomplished. "Many of the parts will be straightened in two or three hits, which will take a total of six or seven seconds," says Kirkell. "The average is eight to 10 seconds."

The remaining shafts—those still being straightened when the 14 seconds has elapsed and those with an initial runout, or deviation from center, exceeding a specified maximum—are automatically rejected by the machine to be hand-straightened.

Stroke control

A key feature enabling the Eitel machine to attain its speed and accuracy is automatic hydraulic stroke control. The machine reacts to each shaft individually rather than operating on a fixed sequence. The programmable controller tells the ram the exact depth needed for each stroke and adjusts the positions of the punches and anvils. Overbending is thereby eliminated, and straighten-



ing is accomplished in fewer strokes than would be needed in the absence of this feature.

"After each stroke, the machine rotates the shaft and measures the camber in three places," says Kirkell. "Then the controller will do a lot of equations and tell the machine what to do next."


By reducing the number of strokes needed to straighten the part, the automatic stroke control not only saves time, but results in lower stresses as well.

A final automatic measurement provides 100% inspection and eliminates the time-consuming chore of measurement by an operator.



Kirkell's automatic loading unloading mechanism, meanwhile, limits operator involvement in this task to the loading of a skid on a feeding mechanism. At the other end, the shafts are automatically stacked up on another skid and pulled away. No operator is needed there.

"The load unload device didn't add any shafts per hour," says Kirkell. "But it did cut the labor in half."

Kirkell indicates he's been very pleased with the machine and is seriously considering investing in a second unit. "We'd like to have another one as soon as business warrants it," he says. 

SURVEY OF TRACK PIN ROLLER STRAIGHTENING CAPABILITY

The purpose of this market survey is to determine the capability, knowledge and experience of existing firms to perform roller straightening of M1A1 track pins in a manufacturing plant environment, as well as obtain an estimate of costs involved.

These track pins become warped due to heat treatment during manufacturing, and require straightening prior to further processing. A million or so pins per year require straightening. Therefore, automated handling is desired. The survey involves: selecting pricing of required equipment; listing of equipment manufacturers capable of furnishing the equipment; listing of present users, applications and equipment used; determine impact roller straightening has on track pin fatigue life (and surface residual stress); and gathering information on possible sources interested in participating in a competitive bid to establish roller straightening capability of M1A1 track pins in a third party plant.

Please answer all questions applicable to your capability, knowledge and experience. Supplemental information concerning equipment, performance, safety, reliability, maintainability, warranty program and any other literature (including pictures) would be useful in this market survey.

NOTE: Your participation in this survey is voluntary and the U.S. Army will not pay for any information provided.

1. General Information

a. Manufacturer :

1. Name : Eitel Presses
2. Mailing Address : Orwigsburg, Penn.
3. Plant Location : Over Lake, Industrial Park

b. Individual(s) Responding to Questionnaire :

1. Name : Werner Kummert - Kummert Tools Inc.
2. Title : Pres.
3. Company Position : P.O. Box 114, Baldwinsville, N.Y. 1302
4. Telephone Number : 315-638-8965

2. Capability :

- a. Are you a manufacturer of roller straightening equipment?
If not, list possible sources of equipment manufacturers from whom you would purchase equipment for this effort. no
- b. Is the roller straightening equipment you propose manufactured in the United States/Canada? If not, where? no

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